## DIURNAL VARIATION OF ATMOSPHERIC ELECTRIC POTENTIAL IN CLEAR WEATHER.[1]

By A. B. CHAUVEAU.

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The normal diurnal variation at a point near the ground shows a double oscillation with two minima, one in the afternoon, the other toward the end of the night; and two maxima, the first of which occurs some hours after sunrise and the second soon after sunset. At a sufficient height and also in winter at low altitudes, the variation tends to become simple by the disappearance of the afternoon minimum. Thus it may be inferred that the true law of the variation is given by a simple oscillation, with maximum in the day and minimum in the night, and that at low stations this law is complicated by the disturbing effect of high temperature in the day or one of its concomitants, e. g., increased evaporation, solar radiation, and dryness. The following general explanation of these phenomena depends, as regards the law, on displacements of positive ions or particles charged positively, of atmospheric origin; and as regards the disturbing effect, on displacements of negative ions emanating from the ground.

The earth is charged negatively, and hence there is by induction an excess of positive ions and particles in the lower layers of the atmosphere. Every cause of increase in the number of heavy particles, such as increased humidity, will result in an increase of the excess of positive ions near the ground, with consequent diminution of electrical potential. Thus is explained the minimum in the early morning. The maximum of the day, according to the law, is explained by the upward convective current carrying aloft the heavy positive ions and particles.

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Similar reasoning will explain the disturbing effects already referred to, if we replace positive ions by negative ions from the ground. These may be imparted to the air by (1) evaporation, (2) photoelectric action of solar radiation, (3) dust. From the fact that the effect is much less marked at the moderate elevation of the summit of the Eiffel Tower it is concluded that dust is probably the most effective agent for the transfer of the negative charges.—*R. C[orless]*.

[1] *See* Comptes Rendus, Paris, Oct. 29, 1917, 165: 594-597.

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## A YEAR'S PENETRATING RADIATION ON THE OBIR.[1]

By V. F. HESS and M. KOFLER.

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Continuous measurements of "penetrating" radiation were made on the Obir (alt. 2,044 m.) from October, 1913, to November, 1914, partly with one and partly with two Wulf's apparatus simultaneously. Each measurement referred to an interval of time varying from 3 to 10 hours. A definite seasonal variation is shown with a minimum in March–April, and a maximum in July–August. The amplitude of the seasonal variation of the day observations is about twice as great as that of the night observations and is considerably less than Gockel's observations gave at normal altitudes. The radiation is independent of temperature; it shows no regular diurnal variation in winter, but in summer there is a slight maximum at $16^h$ [2 p. m.]. The mean values for day and night are equal. Precipitation, specially thunder-rain [?], is accompanied by a distinct increase of the radiation.

The variations of the radiation are both absolutely and relatively smaller than at sea level. This appears to show that the portion of penetrating radiation contributed from outside the atmosphere is nearly constant in intensity. This radiation is apparently not due to the sun, as values for day and night are the same. It is probably due to radium and thorium emanations.—*R. C[orless]*.

[1] Berichte, Akad. Wissensch., Wien, Oct., 1917: Physikal. Ztschr., Dec. 15, 1917, 18: 585-595.